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A NEW SPECIES OF THE TREMATODE GENUS *ALLOCREADIUM*

WITH A REVISION OF THE GENUS AND A KEY TO THE SUB-FAMILY ALLOCREADIINAE*

IVAN E. WALLIN

[WITH TWO PLATES.]

Looss (1899), in his work on the trematode-fauna of Egypt and a natural organization of the genus *Distomum* Retzius, established a genus *Creadium* with the following diagnosis: Worms of submedium size, with a thick, in a contracted condition, almost cylindrical, body that diminishes anteriorly into a thin and very flexible neck part. The posterior end is rounded; suckers greatly developed; cuticula smooth. Intestine with well developed pharynx, long esophagus (in a contracted neck it is bent into an S shape, and on this account appears short); intestinal coeca long. Genital aperture near the forking of the esophagus. Cirrus pouch large, bag-shaped, with well developed cirrus. Testes large and spherical, median, one back of the other, in the posterior part of the body. Ovary also large, anterior to the testes and to the side. Receptaculum seminis and Laurer's canal present, the former voluminous, pear-shaped. Yolk glands very greatly developed, back of the testes they come together and are continuous and completely fill the body. Uterus very short, between the anterior testes and the acetabulum, describing a few convolutions. Eggs relatively large (60 to 90 microns), with weakly colored shells, lying in a row in the uterus, somewhat ventral. The first stage in the development appears to be completed while in the mother. Inhabit (freshwater?) fish. Type: *Creadium isoporum* Lss.

Looss placed *Distomum angusticolle* Hausm. in the genus and pointed out the similarity of a number of distomes described by Stossich to *C. isoporum*. He suggested that they might belong to different closely related genera, and would then be grouped under a new sub-family Creadiinae.

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The name *Creadion,* given to a genus of birds by Viellot in 1816, being very similar to *Creadium,* and according to the usual view precluding the use of the latter term, Looss (1900) changed the name to *Allocreadium.*

Stossich (1900) placed the following species in the genus *Allocreadium: A. pegorchis* Stoss., *A. obovatum* (Molin), and *A. asymphyloporum* Stoss.

Odhner (1901) revised the genus *Allocreadium,* placing the following species in it: *A. fasciatum* (Rud.), *A. labri* (Stoss.) [later, 1902, found it to be synonymous with *A. pulchella* (Rud.)], *A. sinuatum* (Rud.), *A. atomon* (Rud.), *A. transversale* (Rud.), *A. tumidulum* (Rud.), *A. labracis* (Duj.), *A. commune* (Olss.), and *A. genu* (Rud.). Many of the forms that Rudolphi named are difficult to identify on account of the very meager descriptions and the poor illustrations, when given; as a result a number of forms described by later investigators are synonymous. Odhner examined some of the original specimens described by Rudolphi, and with the aid of identical forms that he collected in Sweden he gives complete descriptions and figures of some of the heretofore obscure species.

In a later paper (1902) Odhner placed *A. fasciatum, A. pulchella,* and *A. sinuatum* in a new genus, *Helicometra.* These forms differ essentially from the species of *Allocreadium* proper in having eggs with long unipolar filaments. *Helicometra pulchella* (Rud.) was given as the type of the genus.

Stossich (1902) described a new Allocreadiinian form, characterized by eggs with long unipolar filaments, naming it *Loborchis mutabilis;* it is synonymous with *Helicometra mutabilis.* He mentions in the introduction of his description that Lühe had intimated in a personal communication that he was preparing a description of a new genus, *Loborchis,* for the forms in *Allocreadium,* characterized by eggs with long unipolar filaments. Stossich's form agreeing with the diagnosis that Lühe was preparing, he placed it in *Loborchis.* I have been unable to find this description of *Loborchis,* or any other references to it, and take it for granted that it was never published. Stossich (1903) placed *H. flava* in the genus;

in a later paper (1904^b) he includes *H. gobii* and gives a comparative table of all the described species in the genus *Helicometra.*

In an earlier paper in the same year (1904^a) Stossich established a new genus in the sub-family Allocreadiinae, naming it *Lepocreadium.* The distinguishing characteristics of the genus follow: Cuticula covered with scales, easily coming off; suckers small and equal in size, oral sucker terminal; prepharynx present; pharynx elongated and well developed; genital aperture at anterior edge of acetabulum. Type: *L. album* Stoss. He also places *L. pegorchis* Stoss. in the genus.

There are very few references to Allocreadiinian forms in American literature. MacCallum (1895) describes *Distomum isoporum* Lss. var. *armatum* from Lake Erie and the Grand River of Ontario, occurring in the small intestine of *Aplodinotus grunniens,* and in the intestines of *Lepomis gibbosus* and *Acipenser rubicundus.* This form does not belong in the sub-family Allocreadiinae, as was pointed out by Looss (1902: 785). Linton (1898) described *Distomum simplex* Rud. [synonymous with *Allocreadium atomon* (Rud.)], from Woods Holl, Massachusetts. A single specimen was taken from the intestine of *Microgadus tomcod.* He also describes *Distomum pallens* Rud. [synonymous with *Allocreadium pallens* (Rud.)], from the same locality in the intestine of *Alutera schoepfi.* In the same paper he gives a description of a *Distomum,* of which the species was not determined. A single specimen was collected from Woods Holl, Mass., in the intestine of *Lagocephalus laevigatus.* The description given places the form in the sub-family Allocreadiinae, but it is far too incomplete to establish the exact position of the worm. Stafford (1904) catalogues *Allocreadium isoporum* Lss. from the intestine of *Semotilus bullaris.* He gives the dimensions 2.28 by 0.68 mm., which are quite small for *A. isoporum* (5 by 0.75 mm.).

The trematode that is about to be described is one of a collection made by Prof. Henry B. Ward at Sebago Lake, Maine, in the summer of 1907. It differs specifically from all heretofore described trematodes, and I therefore suggest for it the name:

Allocreadium lobatum, n.sp.

Habitat: Stomach of *Semotilus bullaris.*

The length of *Allocreadium lobatum* varies from 3 to 6.7 mm. and the breadth from 0.72 to 1.5 mm. The general shape of the body is somewhat cylindrical, with the posterior part slightly flattened dorso-ventrally and the extremity rounded. From the acetabulum the body diminishes slightly in diameter to the anterior end, forming an ill-defined "neck" region. In a greatly contracted individual the anterior end may be similar in shape to the posterior end (Fig. 1).

The cuticula covering the body is a smooth homogeneous structure without spines or scales and about 7 microns in thickness. In some cross sections the cuticula showed fine lines dividing it into sections of unequal size (Fig. 12). This could not be seen in all sections, so is undoubtedly the result of fixation or of sectioning. Lying deep in the parenchyma are the elongated epithelial cells which secrete the cuticula; v. Gronkowski (1902) investigated the structure of these cells beneath the cuticula in *Distomum hepaticum, Amphistomum conicum, Distomum variegatum*, and *Distomum lanceolatum* and concludes that they are genuine epithelial cells.

The two suckers are of about equal size, the variation in size in the same individual is, at most, the same as for *A. isoporum*—namely, as 13:14 (Looss, 1894). The oral sucker is circular in outline and is situated sub-terminally; it varies in diameter from 0.455 to 0.473 mm. It has a well-developed musculature, the muscle fibers radiating outward from the central part (Fig. 2). A few large oval cells are present at irregular intervals between the muscle fibers. On the inside it is lined by a thick cuticula, the continuation of the body cuticula. Beneath the cuticula is a thinner membrane, which is continuous around the whole sucker and forms an attachment for the muscles. The acetabulum, in most individuals, is slightly oval in outline, its longer axis lying at right angles to the longer axis of the body. It varies in diameter from 0.455 to 0.509 mm. In structure it is similar to the oral sucker. Its position in the body is at the posterior part of the first fourth of the body.

The digestive system begins directly back of the oral sucker with a well developed pharynx. There is no prepharynx present. The pharynx is slightly oblong in shape, varying from 0.236 to 0.298 mm. in length and about 0.222 mm. in breadth. It has a well developed musculature, which in general appearance is similar to that of the suckers. The heavy cuticula of the oral sucker is continuous through the pharynx and esophagus, terminating at the forking of the intestine. Following the pharynx is a long esophagus, which, in the majority of individuals examined, forks at about the anterior margin of the acetabulum. In one individual the forking occurred at the posterior margin of the acetabulum. Embedded in the parenchyma about the esophagus are a few deeply staining epithelial cells, in appearance like those described by Braun (1879-1893: 671), Looss (1902: 648), and others. These cells secrete the thick cuticula that lines the esophagus. Cells of similar structure are also found about the metraterm, ductus ejaculatorius and beneath the surface of the body cuticula. Surrounding the cuticula of the esophagus is a circular layer of muscular fibers and outside of this is a longitudinal layer (Fig. 5). In normal conditions the esophagus is about 0.1 mm. in diameter. The two intestinal coeca lie laterally and near the dorsal surface. They are about 0.185 mm. in diameter. In some individuals one of the intestinal coeca has a smaller caliber than the other. There is no indication that this condition is the result of contraction. The intestinal coeca are lined by a single layer of cells which are more or less irregular in outline. Large, somewhat oval, nuclei lie near the bases of the cells (Fig. 8). Some of the cells in this layer appear like gland cells, drops of secretion lying on the periphery; clear oval spaces may also be seen at intervals, reminding one of goblet cells in higher animals. Next to the epithelial layer is a single layer of circular muscle fibers, then follow a few scattered longitudinal fibers. The intestinal coeca end for the most part a short distance from the end of the body, in some individuals about midway between the posterior testis and the end of the body.

The excretory system is composed of a single median vesicle reaching from the posterior end of the body to the posterior testis; at this point two fine branches, of much smaller caliber, are given off. The branches lie close together in the dorsal part of the body and pursue a straight course to about the region of the ovary, where they separate and run to the sides. From this point they pursue a very tortuous course and it was impossible to definitely follow the many coils that occupy a great part of the anterior region of the body. The median vesicle is surrounded, especially in the posterior part, by a great number of cells, which have the appearance of gland cells, small ducts leading away from each cell to the vesicle. The vesicle (Fig. 6) is lined with a heavy cuticula, which is more or less ragged in places and gives the appearance of cilia. At its anterior end the vesicle has a smaller caliber and the cuticula is not as heavy here as it is in the posterior part. The "gland" cells lying about the vesicle are similar in appearance to the epithelial cells mentioned in this paper and should be classed with them.

The testes in *Allocreadium lobatum* differ from all other species in the genus in that they are distinctly lobed. They occupy a position in the body that is characteristic for the genus, one lying back of the other in the anterior part of the posterior half of the body. There is quite a variation in the dimensions of the testes in different individuals; the length varies from 0.374 to 0.546 mm. and the breadth from 0.400 to 0.728 mm. The most common type of form is broader than long, but this is reversed in some specimens. From each testis a vas deferens is given off, which pursues an almost straight course forward and each testis opens separately into the seminal vesicle. The vasa deferentia are easily recognized in section on account of their size and the darkly stained spermatozoa that are generally present in the lumen. The lumen of the tube measures from 0.028 to 0.044 mm. in diameter.

The genital pore lies in the median line from 0.14 to 0.29 mm. anterior to the acetabulum. Directly beneath the pore is the common genital atrium, which is lined by a thick cuticula that has a rough appearance and is surrounded by a great number of muscular fibers.

The cirrus pouch (Fig. 7) extends from the center of the acetabulum to the genital pore; it curves down over the acetabulum so that in a sagittal section it would appear bent into a crescent shape. It measures about 0.15 mm. in breadth at its posterior end and diminishes in size anteriorly. The wall of the cirrus pouch is made up of a single layer of muscle fibers enclosed by limiting membranes. Darkly staining nuclei were observed, at intervals, in the outer membrane. In the posterior part of the cirrus pouch is a large seminal vesicle containing a vast number of spermatozoa. The vesicle, which is bent into a half-circle, communicates anteriorly with a large pars prostatica, which is also curved. The pars prostatica and seminal vesicle together form a figure S. The wall of the pars prostatica is made up of circular and longitudinal muscle fibers enclosed by thin membranes. The two muscular layers and the arrangement of their fibers can best be seen in a tangential section, such as shown in Figure 10 at x. In the lumen of the tube can be seen spherical masses of unequal size, which at first sight look like cells, but a closer study shows them to be structureless. These spherical masses are drops of secretion that are the product of the many prostate glands embedded in the parenchyma about the pars prostatica. The ducts of the prostate glands can easily be traced into the wall of the prostatica. The pars prostatica communicates anteriorly with a long ductus ejaculatorius which measures about 0.9 mm. in length and from 0.039 to 0.065 mm. in thickness. Lying outside of the wall of the ductus and attached to it are a great number of longitudinal muscle fibers (Fig. 9) which undoubtedly serve to draw the ductus back into the cirrus pouch after it has been evaginated. In a cross section of the ductus ejaculatorius these muscle bands have the appearance of a thick fringe about the tube. Beneath this longitudinal layer is a layer of circular muscle fibers. The ductus ejaculatorius is lined by a heavy cuticula, which, in the anterior half of the tube, is thrown into folds and has a ragged appearance. Epithelial cells lie about the whole length of the ductus ejaculatorius and undoubtedly secrete the heavy cuticula lining the organ.

The ovary lies in the median line directly posterior to the acetabulum. It is spherical in shape and measures from 0.303 to 0.327 mm. in diameter. The ovary is completely filled with mature and developing ova, the mature ova having a large circular nucleus in which the chromatin is in a spireme and surrounded by cytoplasm, which is variously shaped to accommodate the space in which it is found. The mature ova measure about 0.015 mm. in diameter. From the ventral side of the ovary the oviduct leads away: it measures from 0.015 to 0.020 mm. in width. There is no muscular tissue in the walls of the ovary and oviduct; a thick membrane limits the ovary and is continuous into the oviduct. Large nuclei are found at intervals in the membrane. The oviduct has the same structure and caliber throughout its length, there being no indication of an oöcapt (Fig. 3); it measures about 0.106 mm. in length.

Between the ovary and the testes lies the receptaculum seminis, a little to the right of the median line. It is a very large oblong sack measuring about 0.418 mm. in length and 0.236 mm. in width. The anterior end is slightly drawn out and communicates with Laurer's canal, which pursues a straight course to the right dorsal surface. A swelling occurs in the tube a short distance from the receptacle; at this point a branch is given off which enters the oviduct (Fig. 11).

The yolk glands in *Allocreadium lobatum* are profusely developed and are characteristic of the genus. The follicles are large spherical masses filling the lateral areas of the body and are continuous posterior to the testes. Anteriorly the yolk glands extend to the level of the ovary. Two main ducts collect the yolk cells from the two sides (Fig. 11); they come together in the median line and form a yolk reservoir, which lies ventral and posterior to the ovary. The yolk reservoir is drawn out anteriorly and communicates with a tube whose caliber is large enough to contain only a single row of yolk cells. This tube runs forward a short distance and then turns back. At the point of the bending the oviduct enters it. The caliber continues the same for a short distance, then widens out to form the ootype. In this part of the tube—that is, from the point that the oviduct enters—the lining is very thick and contains nuclei. Embedded in the parenchyma about the ootype are great numbers of gland cells, the shell glands, with their ducts, leading into the wall of the ootype. The wall of the ootype is composed of quite a thick membrane containing nuclei, outside of which is muscular tissue.

The ootype is followed by a short tube of very much smaller caliber, which is the beginning of the uterus. The uterus makes many bends and fills up a great part of the space between the anterior testis and the acetabulum. It was impossible to follow the uterus in its complete length on account of the tearing produced when the knife passed through the eggs. The uterus has a large caliber, about two or three times the width of an egg. A little posterior to the cirrus pouch the metraterm unites with the uterus; it pursues quite a straight course to the genital atrium. The metraterm is lined by a thick cuticula, which has a very ragged surface. Beneath the cuticula is a layer of circular muscle fibers, then follow the longitudinal fibers arranged like those about the ductus ejaculatorius. The lumen of the tube is much smaller than the width of an egg, and when an egg is passing through a swelling is produced at the place where it may be located. Darkly staining epithelial cells are also present in the parenchyma about the metraterm (Fig. 7).

The eggs in *Allocreadium lobatum* are very numerous. They are quite large, measuring from 0.067 to 0.085 mm. in length and from 0.046 to 0.057 mm. in breadth. A small cap is found at one pole of the egg. This could only be recognized when an oil immersion objective was used (Fig. 4). The shell is colored a very light yellow.

The body musculature is not greatly developed; a few scattered fibers may be seen in a cross section. The fibers are slightly more numerous in the anterior part of the body.

The parenchyma of the body does not differ from that usually found in trematodes.

In reading the literature on trematodes I have met with a number of forms described, notably, by Stossich, which bear a striking resemblance, both in illustration and description, to the forms in the genus *Allocreadium.* Looss (1899: 577) points out the close relationship of these forms to *Creadium (Allocreadium)* and suggests that they might belong to closely related genera. While they do not fully agree with the diagnosis of *Allocreadium,* the variations, in my estimation, are not of sufficient importance to place them in new genera. I have ventured, relying on the original descriptions and illustrations of Stossich, to place the following forms in the genus *Allocreadium: "Distomum fasciatum* Rud." of Stossich, *D. mormyri* Stoss., and *D. pallens* Rud.

Allocreadium colligatum n. sp.

1885. *"Distomum fasciatum* Rud.," Stossich p. 5.
1898. *"Distomum fasciatum* Rud.," Stossich p. 46.

This form described by Stossich is certainly not identical with *Helicometra fasciata* (Rud.), as described by Odhner (1901). Monticelli (1893: 192) gives an illustration of *D. fasciatum* Rud. or *Hel. fasciata* (Rud.), and points out that it differs essentially from Stossich's *D. fasciatum* Rud. He also makes mention of eggs with long unipolar filaments which are not mentioned by Stossich. Braun (1879-1893, pl. xxii, Fig. 8, A. and B.) gives a reproduction of Stossich's drawing of *D. fasciatum* Rud., and beside it he reproduces Willemoes-Suhm's drawing of an egg from *D. fasciatum* Rud. which has a long unipolar filament. This is undoubtedly a confusion of the two distinct species, the egg belonging to *Helicometra fasciata.* Comparing the description and illustration of Stossich's *D. fasciatum* with Odhner's description and illustration of *Helicometra fasciata,* the following differences are notable: In Stossich's *D. fasciatum* the ovary is globular, testes spherical, and the vitellaria extend to the oral sucker; in *Helicometra fasciata* the ovary is lobed, testes lobed, and the vitellaria extend to the anterior part of the acetabulum. These differences clearly show that the two forms are not identical, but distinct species, and with the difference in eggs they belong in separate genera, Stossich's *D. fasciatum* falling in the genus *Allocreadium.*

Stossich (1885) gives the following description for this form:

Collected from the intestine of *Labrus mixtus.*

Body elongated, elliptical, somewhat depressed, unarmed, uncolored; posterior extremity rounded. Oral sucker terminal, robust, and united directly with a large pharynx. Acetabulum very large, prominent, without pedicle, in form somewhat circular. Testes two, large, sub-spherical, and situated one on the other in the middle of the body. Cirrus very long, cylindrical, bends into a spiral and terminates in an enlarged knob. Vitellaria very greatly developed; they occupy not only the whole posterior part of the body, but some of the follicles are found almost at the oral sucker.

Length 2 mm.; breadth 0.3 to 0.5 mm.

Allocreadium mormyri (Stoss.).

1885. *Distomum mormyri* Stoss., Stossich p. 5.
1898. *Distomum mormyri* Stoss., Stossich p. 36.

This form is very much like *Allocreadium obovatum* Molin; it differs from it, however, in the size of the body and in the shape and size of the pharynx. The esophagus in *mormyri,* as well as in *obovatum,* is very short and in this particular does not agree with the diagnosis of the genus. A comparative study of the Allocreadiinae forms shows a gradation in the length of the esophagus from a long to a very short one. It would be hard to draw a line between forms which should be excluded from the genus and those that would satisfy the diagnosis on this one character. In all other particulars the form agrees with the diagnosis of *Allocreadium.* Following is the description of *D. mormyri* given by Stossich:

Body unarmed, depressed, subovate, rounded at the two extremities. Oral sucker sub-terminal, circular, and is bordered by a muscular girdle. Acetabulum much larger than oral sucker, elliptical-transverse, somewhat prominent, aperture transverse. Genital aperture is situated under the pharynx. Cirrus somewhat cylindrical, unarmed, somewhat sharpened at the extremity; cirrus pouch bent into a semi-circle extending beyond the posterior margin of the acetabulum. Testes two, large, ovate, situated one behind the other longitudinally in the body. Vitellaria greatly developed, follicles small spheres; they occupy the whole posterior part of the body and extend to the pharynx. Uterus short; eggs relatively large, elliptical, colored intensely yellowish-brown.

Length 2 to 2.5 mm.; breadth 0.75 to 1 mm.

Allocreadium pallens (Rud.).

1819. *Distomum pallens* Rud., Rudolphi p. 408.
1887. *Distomum pallens* Rud., Stossich p. 4.
1898. *Distomum pallens* Rud., Stossich p. 47.
1898. *Distomum pallens* Rud., Linton p. 526, pl. xlvii, figures 8 and 9.

I have been unable to find a good illustration of this form, so have had to rely for generic determination on the accuracy of the description given by Stossich. Linton (1898) figures a *D. pallens* Rud., but the drawing is so poorly executed that it is not serviceable. The form fully agrees with the diagnosis of *Allocreadium* with the exception of the esophagus, which is short. The following description is compiled from Stossick (1887 and 1898):

From the intestine of *Chrysophrys surata*.

Body elongated, unarmed, posterior and rounded. Acetabulum very prominent, situated at the base of the neck, twice as large as the oral sucker; aperture elliptical-transverse.

Oral sucker sub-terminal, globular, and provided with longitudinal aperture; from the center a short canal (prepharynx) leads back and communicates with a large bulbus esophagus (pharynx), which has a quadrangular shape; this departs into a short esophagus, which divides into two intestinal coeca. The intestinal coeca extend to the extreme posterior end of the body.

Testes two, posterior, large, elliptical; cirrus pouch in the vicinity of the acetabulum, contains the seminal vesicle. Ovary globular, next to the testes. The yolk glands are numerous, composed of small globular follicles, extend from the extreme caudal end to the ovary. Seminal receptacle large and situated to the right side of the ovary. Eggs elliptical, limited in number. Genital aperture situated below the forking of the esophagus.

Length 5 to 6.5 mm.; breadth 0.5 to 1 mm.

The following key comprises all the species described in the subfamily Allocreadiinae with the exception of *Helicometra sinuata* (Rud.) and *Allocreadium asymphyloporum* Stoss. *H. sinuata* has not been definitely established as a distinct species, so it has been omitted on this account; the description of *A. asymphyloporum* is so incomplete that it was not possible to give it a definite place in the key.

Worms from small to medium size; cuticula without spines; long intestinal coeca; genital aperture near forking of esophagus; seminal receptacle large; yolk glands profusely developed, coming together and are continuous in the posterior body; uterus short between anterior testis and acetabulum. In fish. SUB-FAM. ALLOCREADÜNAE LOOSS.

A.—Eggs with long, unipolar filaments; esophagus of moderate length; genital aperture in median line; ovary lobed. In sea-fish. GENUS *Helicometra* Odhner.

I. Testes lobed.

1. Acetabulum little larger than oral sucker; pharynx globular or elongated, prepharynx short.

a. Ovary 6-8 lobed; vitellaria extend to anterior margin of acetabulum; pharynx globular; length 2 to 3 mm. *Helicometra fasciata* (Rud.)

b. Ovary 3 lobed; vitellaria extend to genital aperature; cirrus pouch extends to anterior margin of acetabulum; pharynx globular; length 2 to 3 mm. *Helicometra flava* (Stoss.)

2. Acetabulum almost double the size of the oral sucker; pharynx squarish in outline; prepharynx short or long; cirrus pouch extends to anterior margin of acetabulum; ovary 4-5 lobed.

a. Vitellaria extend to oral sucker; prepharynx short; pharynx sub-quadrate; length 4 to 5 mm. *Helicometra mutabilis* (Stoss.)

b. Vitellaria comparatively sparse; extend to the genital aperture; prepharynx long; pharynx broader than long; length 1 to 2.5 mm. *Helicometra gobii* (Stoss.)

II. Testes rounded; acetabulum larger than oral sucker; pharynx globular.

1. Vitellaria extend to the bifurcation of the esophagus; prepharynx short; intestinal coeca extend to extreme posterior end; ovary 3 lobed; length, 2 mm.; breadth, 0.5 to 0.75 mm. *Helicometra pulchella* (Rud.)

2. Vitellaria extend to oral sucker; prepharynx absent; intestinal coeca extend to short distance from posterior end; ovary multilobed; length, 2.3 mm.; breadth, 0.9 to 1 mm. *Helicometra sinuata* (Rud.)

B.—Eggs without filament.

I. Suckers well developed; cuticula smooth; esophagus long; genital aperture near forking of intestine. In (fresh-water?) fish. GENUS *Allocreadium* Looss.

1. Ovary lobed; prepharynx present; pharynx globular; forking of esophagus about midway between suckers; eggs numerous.

a. Vitellaria extend to acetabulum; cirrus pouch slender, extends to a little beyond acetabulum; length, 1.5 to 3.4 mm.
Allocreadium atomon (Rud.)

b. Vitellaria extend to pharynx; cirrus pouch club-shaped, extends to posterior border of acetabulum; length, 2 to 6 mm.
Allocreadium labracis (Duj.)

2. Ovary spherical.

a. Testes lobed; vitellaria do not extend anterior to acetabulum.

aa. Suckers of equal size; no prepharynx; cirrus pouch extends to ovary; seminal receptacle between ovary and testes; eggs very numerous, 0.067 to 0.085 by 0.046 to 0.057 mm.; length, 4 to 6.7 mm.; breadth, 1 to 1.5 mm.
Allocreadium lobatum Wallin.

b. Testes rounded; vitellaria extend to acetabulum or beyond.

aa. Prepharynx present.

aaa. Vitellaria extend to ovary; acetabulum twice as large as oral sucker, and pharynx quadrangular; length, 5 to 6.5 mm.; breadth, 0.5 to 1 mm.
Allocreadium pallens (Rud.)

bbb. Vitellaria extend to acetabulum.

x. Acetabulum equal in size to oral sucker; length, 5 mm.
Allocreadium isoporum Looss.

y. Acetabulum 1½ times as large as oral sucker.
Allocreadium transversale (Rud.)

ccc. Vitellaria extend to pharynx.

x. Cirrus pouch long and slender, extends to ovary; ovary to right of median line; genital aperature in median line; length, 2 to 2.5 mm.; breadth, 0.5 to 6 mm. *Allocreadium genu* (Rud.)

y. Cirrus pouch quite large, extends a little back of acetabulum; ovary to left of median line; genital aperture to right of median line; length, 1.5 mm.; breadth, 0.3 mm.
Allocreadium angusticolle (Hausm.)

z. Cirrus pouch curves into a crescent shape, extending a little back of acetabulum; ovary to right of median line; genital aperture to left of median line; esophagus very short.

xx. Pharynx almost equal in size to oral sucker, globular; ovary sub-spherical; length, 2.5 to 4.5 mm.; breadth, 0.8 to 1 mm.
Allocreadium obovatum (Molin.)

yy. Pharynx elongated; ovary spherical; length, 2 to 2.5 mm.; breadth, 0.75 to 1 mm.
Allocreadium mormyri (Stoss.)

bb. Prepharynx absent.

aaa. Pharynx long and cylindrical; esophagus short (0.06 mm.), genital aperture in median line; cirrus pouch to 1 mm. *Allocreadium commune* (Olss.)
extends to ovary; length, 1.4 to 3 mm.; breadth, 0.4

bbb. Pharynx globular; esophagus short; cirrus pouch extending to middle of ovary; length, 2 mm.; breadth, 0.3 to 0.5 mm. *Allocreadium fasciatum* (Stoss.)

ccc. Pharynx globular; esophagus long (0.1 mm.); genital aperture left of posterior edge of pharynx; cirrus pouch extends to anterior border of acetabulum; length, 1.5 to 2.25 mm.; breadth, 0.35 to 0.5 mm. *Allocreadium tumidulum* (Rud.)

II. Suckers small, of equal size; cuticula with scales easily coming off; esophagus short; genital aperture anterior and left of acetabulum. In sea-fish. GENUS *Lepocreadium* Stossich.

1. Long prepharynx; testes at extreme posterior end of body; seminal receptacle spherical; penis unarmed; vitellaria extending to pharynx; length, 2 mm.; breadth, 1.75 mm. *Lepocreadium pegorchis* Stoss.
2. Short prepharynx; testes at anterior second half; seminal receptacle bottle-shaped; penis armed; vitellaria extending to acetabulum; length, 1 to 2.5 mm.; breadth, 0.3 to 0.6 mm. *Lepocreadium album* Stoss.

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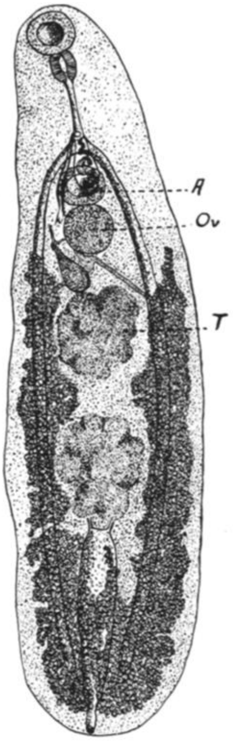
PLATE I



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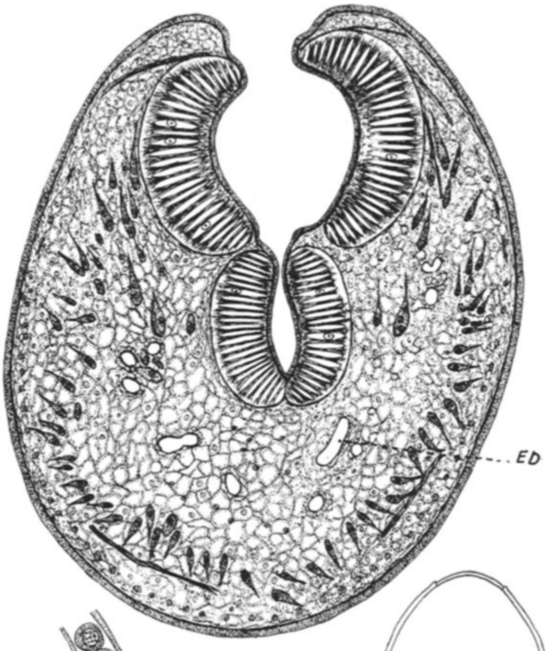

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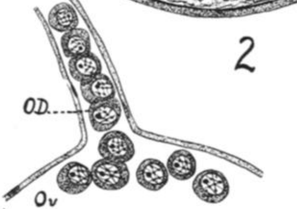

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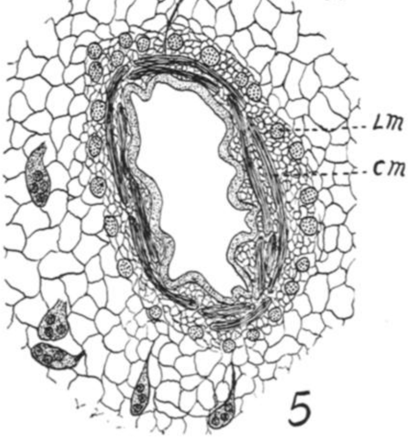

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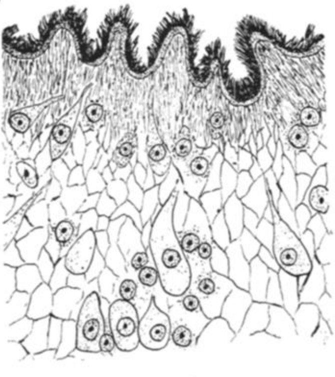

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EXPLANATION OF FIGURES

All figures were drawn with the camera lucida. The following abbreviations hold for all figures:

A.	Acetabulum.
C.	Cuticula.
CM.	Circular Muscle.
CP.	Cirrus Pouch.
DE.	Ductus Ejaculatorius.
EC.	Epithelial Cells.
ED.	Excretory duct.
LM.	Longitudinal Muscles.
LC.	Laurer's Canal.
M.	Metraterm.
Mu.	Muscle fibres.
Oo.	Oötype.
OD.	Oviduct.
Ov.	Ovary.
PG.	Prostate Glands.
PP.	Pars Prostatica.
S.	Secretions.
SG.	Shell Gland.
SR.	Seminal Receptacle.
T.	Testis.
U.	Uterus.
V.	Vitellaria.
VD.	Vas Deferens.
YR.	Yolk Reservoir.

RUDOLPH, C. A.

PLATE I.

Fig. 1.—*Allocreadium lobatum;* toto, the uterus is not represented in the figure. × 25.

Fig. 2.—Tangential section of anterior end. × 250.

Fig. 3.—Section through ovary and oviduct. × 400.

Fig. 4.—Egg. × 400.

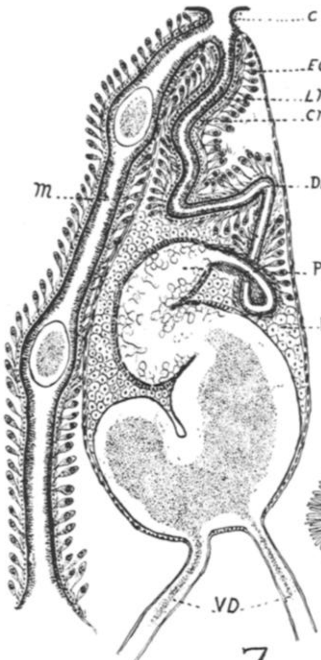
Fig. 5.—Cross-section of esophagus. × 400.

Fig. 6.—Portion of a cross-section of excretory vesicle. × 400.

PLATE II.

Fig. 7.—Optical section of cirrus pouch and metraterm. × 80.
Fig. 8.—Cross-section of intestinal coecum. × 400.
Fig. 9.—Section of ductus ejaculatorius. × 250.
Fig. 10.—Section of pars prostatica. × 400.
Fig. 11.—A reconstruction of the egg-forming organs. × 80.
Fig. 12.—Part of a cross-section showing the cuticula. × 400.

PLATE II



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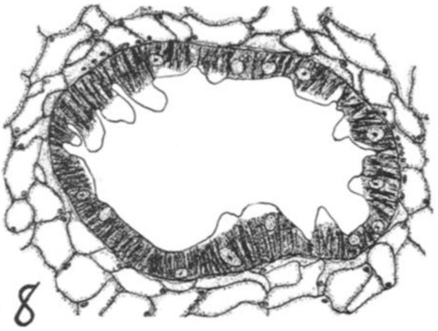

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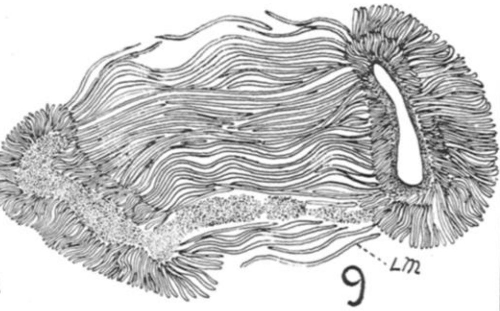

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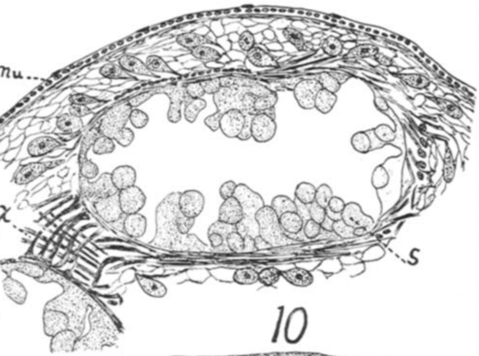

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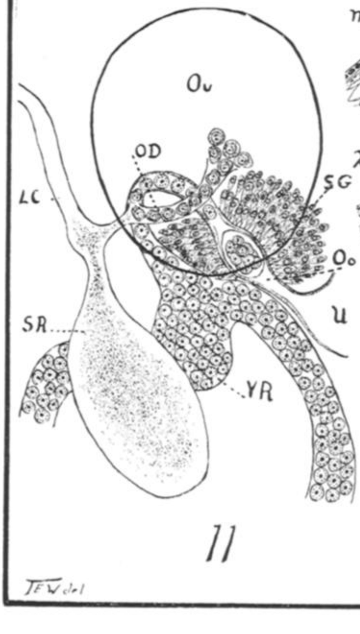

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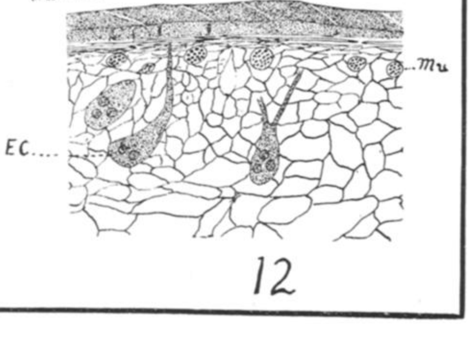

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